value, each one pixel value is output, as shown in Fig.81B. The pixel value output by the pixel E corresponds to the integrated value of the pixel value f'(x) in the range of the light reception area.

The correlation calculating unit 703 generates the correlation value between the pixel value of the pixel D and that of the pixel E, and the correlation value between the pixel value of the pixel E and that of the pixel F, to route the so-generated correlation value to the pixel value generator 702. The correlation value calculated by the correlation calculating unit 703 is calculated based on the difference between the pixel value of the pixel D and that of the pixel E, or on the difference between the pixel value of the pixel E and that of the pixel F. When the pixel values of neighboring pixels are closer to each other, these pixels may be said to have higher correlation. That is, a smaller value of the difference between pixel values indicate stronger correlation.

So, if the difference between the pixel value of the pixel D and that of the pixel E, or the difference between the pixel value of the pixel E and that of the pixel F, is directly used as a correlation value, the correlation value, which is the smaller difference value, exhibits stronger correlation.

For example, if the correlation between the pixel value of the pixel D and that of the pixel E are stronger than that between the pixel value of the pixel E and that of the pixel F, the pixel value generator 702 divides the pixel value of the pixel D by 2 to use the resulting value as pixel data of the area i.

Based on the pixel value of the pixel E and on the pixel value of the area i, the pixel value generator 702 calculates the pixel values of the pixel data of the area j in accordance with the equation (75) or (76), as shown in Fig.81D.

The pixel value generator 702 calculates the pixel values of the pixel data of the area g and those of the pixel data of the area h, for e.g., the pixel D, to calculate the pixel value of the pixel data of the area i and the pixel value of the pixel data of the area j, and then to calculate the pixel value of the pixel data of the area k and the pixel value of the pixel data of the area l, and so on, to calculate the pixel values of the pixel data in the picture as described above to generate a horizontal double-density picture comprehending the pixel values of the pixel data calculated to furnish the so-generated horizontal double-density picture to the frame memory 704.

Similarly to the pixel value generator 702, the pixel value generating unit 705 calculates, from the correlation of the pixel values of three vertically arrayed pixels of the horizontal double-density picture, supplied from the correlation calculating unit 706, and from the pixel values of the three pixels, the pixel values of the picture data corresponding to two areas obtained on vertically splitting the light reception area of the pixel, to thereby generate the double density picture.

When fed with the picture shown as an example in Fig.82, the pixel value generating unit 702 generates a double-density picture shown as an example in Fig.83.

When fed with a picture, shown as an example in Fig.82, the pixel value generating unit 705 generates a picture, shown as an example in Fig.84. When fed

with a horizontal double-density picture, shown as an example in Fig.83, the pixel value generating unit 705 generates a double-density picture, shown as an example in Fig.85.

Fig.86 is a flowchart for illustrating the processing for generating the double-density picture by the signal processor 12, a structure of which is shown in Fig.78. At step S601, the signal processor 12 acquires an input picture to store it in the frame memory 701.

At step S602, the correlation calculating unit 703 selects one of the pixels in the picture as a considered pixel, and finds a pixel horizontally neighboring to the considered pixel, based on the pixel value stored in the frame memory 701. At step S603, the pixel value generator 702 generates a pixel value of pixel data lying on one side of the horizontal double-density picture from a pixel value exhibiting stronger correlation, that is a higher correlation value.

Based on the characteristics of the CCD, the pixel value generator 702 at step S604 generates pixel values of other pixel data of the horizontal double-density picture. Specifically, the pixel value generator 702 calculates pixel values of the other picture data of the horizontal double-density picture, based on the pixel value calculated by the processing of step S603 and on the pixel value of the picture data of the input picture, in accordance with the equations (75) and (76) explained with reference to Fig.80. The picture data of the horizontal double-density picture for the considered pixel, generated by the processing at steps S603 and S604, are stored in the

frame memory 704.

At step S605, the pixel value generator 702 checks whether or not the processing of the entire picture has come to a close. If it is determined that the processing of the entire picture has come to a close, the program reverts to step S602 to select the next pixel as the considered pixel to repeat the processing of generating the horizontal double-density picture.

If it is determined at step S605 that the processing of the entire picture has come to a close, the correlation calculating unit 706 selects one of the pixels in the picture as the considered pixel to find the correlation value of the pixel neighboring to the considered pixel in the vertical direction based on the pixel value of the horizontal double-density picture stored in the frame memory 704. At step S607, the pixel value generating unit 705 generates the pixel value of the one side of the double-density picture from the pixel values of the stronger correlation, based on the correlation value supplied from the correlation calculating unit 706.

At step S608, as at step S604, the pixel value generating unit 705 generates the other pixel value of the double-density picture, based on the characteristics of the CCD. Specifically, the pixel value generator 702 calculates the pixel values of the other picture data of the double-density picture, based on the pixel values calculated by the processing at step S607 and on the pixel value of the pixel data of the horizontal double-density picture, in accordance with the equations (75) and (76) explained with reference to Fig.80.

At step S609, the pixel value generating unit 705 decides whether or not the processing of the entire picture has been finished. If it is decided that the processing of the entire picture has not been finished, the program reverts to step S606 to select the next pixel as the considered pixel to repeat the processing of generating the double-density picture.

If it is decided at step S609 that the processing of the entire picture has been finished, the pixel value generating unit 705 outputs the so-generated double-density picture to complete the processing.

In this manner, a double-density picture, the number of pixels of which in the vertical and in the horizontal directions are doubled, may be produced from the input picture by the signal processor 12, the structure of which is shown in Fig.78.

The signal processor 12, the structure of which is shown in Fig.78, is able to generate a picture of high spatial resolution by performing signal processing taking account of the pixel correlation and the integrating effect of the CCD with respect to the space.

In the foregoing, a picture of the real space having a three-dimensional space and the time axis information is mapped on a time space having the two-dimensional space and the time axis information using a video camera. The present invention is, however, not limited to this embodiment and may be applied to correction of distortion caused by projecting the first information of a higher order first dimension to the lower-order second dimension, extraction of the significant information or to synthesis

of more spontaneous pictures.

The sensor 11 may also be a sensor exemplified by, for example, a BBD (bucket brigard device), a CID (charge injection device) or a CDD (charge priming device), without being limited to a CCD. The sensor 11 may also be a sensor in which detection devices are arranged in a row instead of in a matrix.

The recording medium, having recorded thereon a program for executing the signal processing of the present invention may not only be constructed by a package medium, distributed to users for furnishing the program separately from a computer, inclusive of a magnetic disc 51, such as a floppy disc, having the program pre-recorded thereon, an optical disc 52, such as CD-ROM, Compact Disc, read-only memory or DVD (digital versatile disc), a magneto-optical disc 53, such as MD (mini-disc) or a semiconductor memory 54. But may also be constructed by a ROM 22 furnished to the user in a pre-assembled state in a computer, and having the program recorded thereon, and a hard disc included in the memory unit 28.

It should be noted that, in the present specification, the step for stating a program recorded on a recording medium includes not only the processing carried out chronologically in the specified sequence but also the processing that is not necessarily processed chronologically but is executed in parallel or batch-wise.

Thus, based on the area information specifying a foreground area made up only of foreground object components making up a foreground object in the picture data, a background area made up only of background object components making up a

background object in the picture data, and on a mixed area which is a mixture of the foreground object components and the background object components in the picture data, and on the picture data, the mixed area including a covered background area formed at a leading end in the movement direction of the foreground object, and an uncovered background area formed at a trailing end of the foreground object, a processing unit made up of pixel data lying on at least a straight line extending in a direction coincident with the direction of movement of the foreground object from an outer end of the covered background area to an outer end of the uncovered background area, centered about the foreground area, are set. A normal equation is then generated by setting pixel values of pixels in the processing unit decided based on the processing unit and an unknown dividing value obtained on dividing the foreground object components in the mixed area with a predetermined dividing number. This normal equation is solved by the least square method to generate foreground object components adjusted for the quantity of movement blurring to adjust the movement blurring quantity.

Also, sample data present in detection data lying ahead and at back of the considered detection data where there exist considered sample data which is the sample data under consideration is extracted as foreground sample data corresponding to the foreground in the real world, whilst sample data present in detection data lying ahead and at back of the considered detection data where there exist considered sample data which is the sample data under consideration is extracted as background

sample data corresponding to the background in the real world, and the mixing ratio of the considered sample data is detected based on the considered sample data, foreground sample data and on the background sample data, thereby enabling the detection of the mixing ratio.

The still/movement decision is given, based on the detection data, and a mixed area containing sample data comprised of a mixture of plural objects in the real world is detected, thereby enabling detection of the mixing ratio.

The second signal of a second dimension is acquired by detecting the first signal of the real world having a first dimension as mapped on the sensor, with the second dimension being lower than the first dimension, and the signal processing is performed on the second signal, thereby enabling the significant information buried due to projection to be extracted from the second signal.

Since the second signal is acquired by detecting the first signal of the real world having the first dimension by the sensor, with the second signal being of a second dimension lower than the first dimension and presenting distortion relative to the first signal, and a third signal, alleviated in distortion relative to the second signal, is generated by processing based on the second signal, it is possible to alleviate the signal distortion.

In the detection signal, the foreground area, composed only of the foreground object components, constituting the foreground object, the background area, composed only of the background object components, constituting the background object, and

the mixed area composed of the foreground object components and the background object components, are specified, the mixing ratio of the foreground object components and background object components at least in the mixed area is detected, and the foreground object components and background object components are separated from each other based on the specified results and on the mixing ratio, thus enabling utilization of the foreground and background objects as data of higher quality.

In the detection signal, the foreground area, composed only of the foreground object components, constituting the foreground object, the background area, composed only of the background object components, constituting the background object, and the mixed area composed of the foreground object components and the background object components, are specified, and the mixing ratio of the foreground and background object components in at least the mixed area is determined based on the specified results, thus enabling detection of the mixing ratio as the significant information.

The mixing ratio of the foreground and background object components in the mixed area comprised of a mixture of the foreground object components, constituting the foreground object, and the background object components, constituting the background object, is detected, and the foreground and background object components are separated from each other based on the mixing ratio, thus enabling utilization of the foreground and background objects as data of higher quality.